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U.S. DEPARTMENT OF ENERGY

Best of the Betters: 2020 Better Project and Better Practice Presentations

Wednesday, June 10

11:00 am-12:30 pm ET

Alexander Zhang

Lineage Logistics

Submit Questions
www.slido.com event code **#bbsummit**
then go to room **“Best of the Betters”**

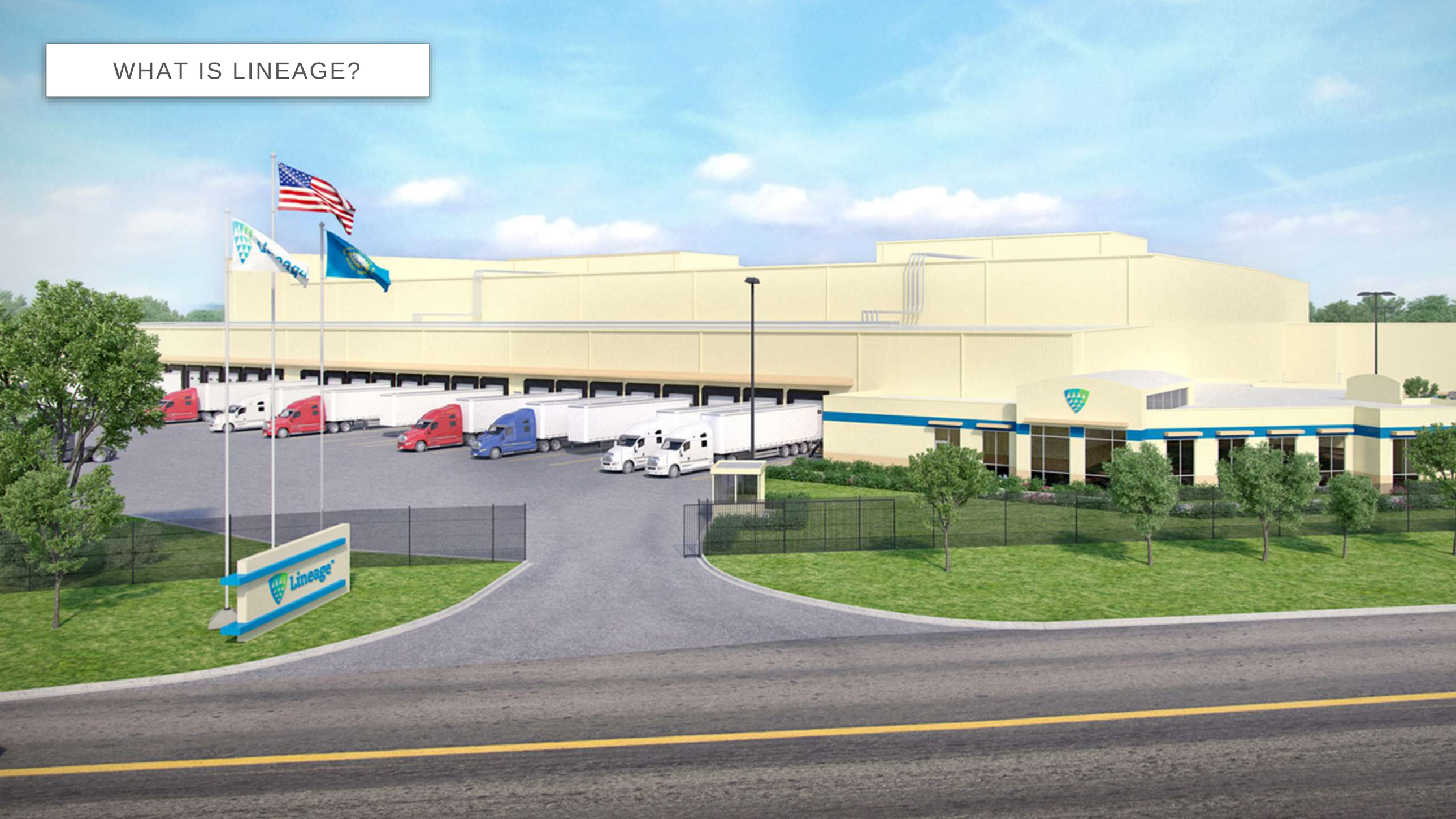
U.S. DEPARTMENT OF ENERGY

Blast Freezing Process and Design Optimization

Alexander Zhang, Senior Systems Engineer
Lineage Logistics Data Science

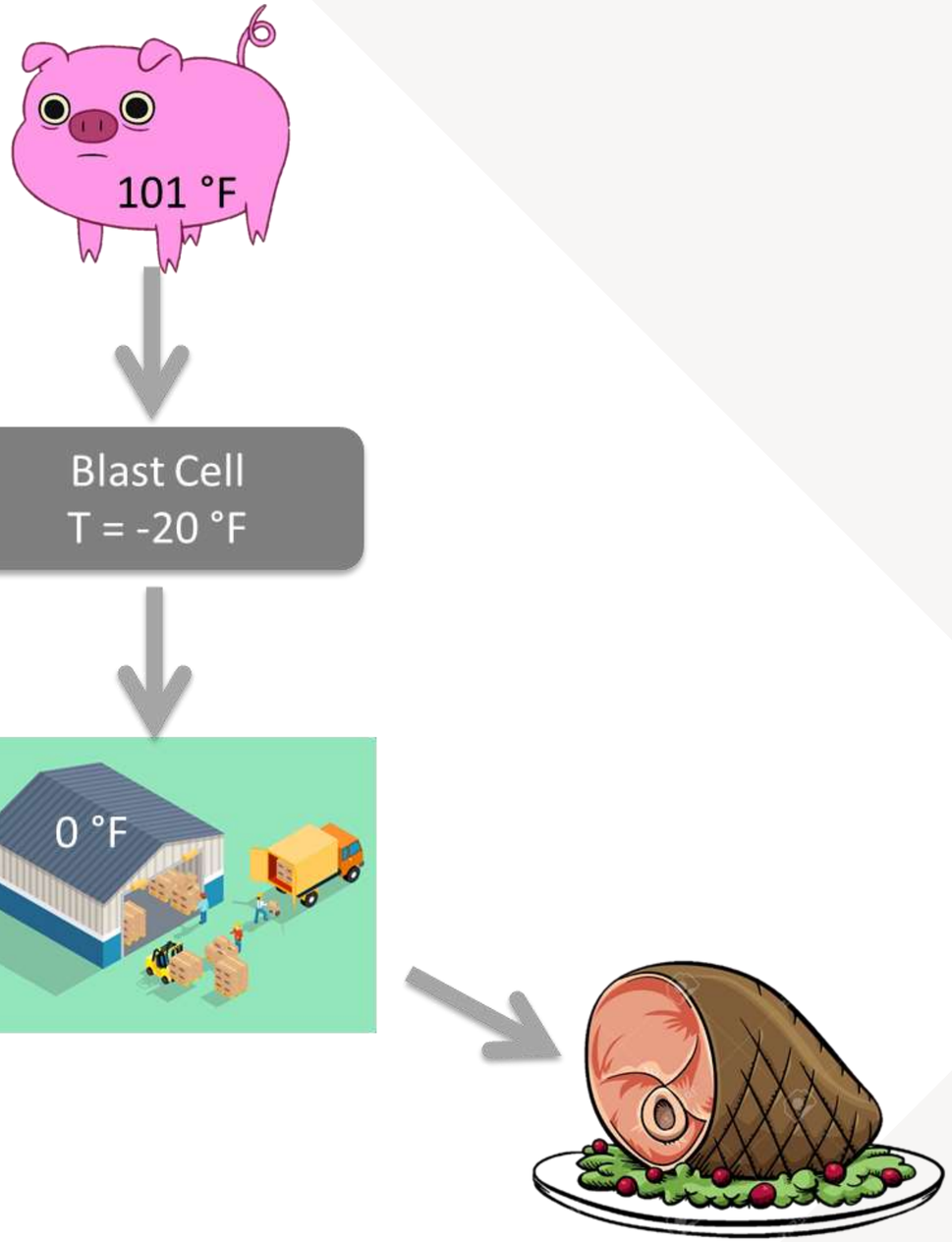
Lineage

WHAT IS LINEAGE?



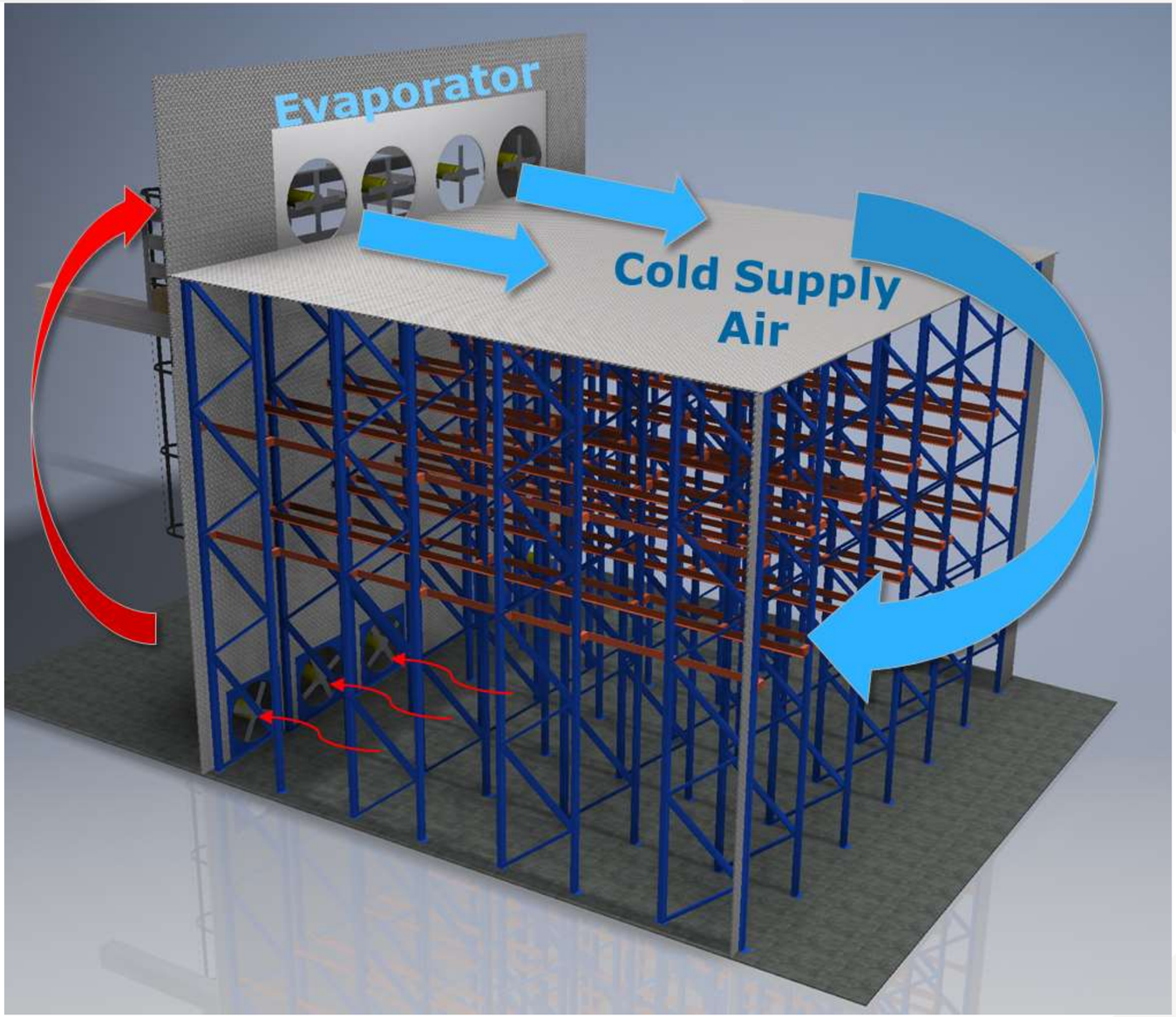

Lineage
Lineage Headquarters
Lineage Facilities (New)
Lineage Facilities
Port Facilities
Major Logistics Market
SEATTLE
TACOMA
NORCAL
LOS ANGELES
INLAND EMPIRE
AUSTRALIA
NEW ZEALAND
CHICAGO
NOVI
KANSAS CITY
FORT WORTH
DALLAS
HOUSTON
ATLANTA
NEW ORLEANS
ALLENTOWN
NY/NJ
BOSTON
NORFOLK
CHARLESTON
SAVANNAH
JACKSONVILLE
MIAMI
UK
NETHERLANDS
BELGIUM
CHINA
VIETNAM
SRI LANKA

BLAST FREEZING



BLAST PRODUCT

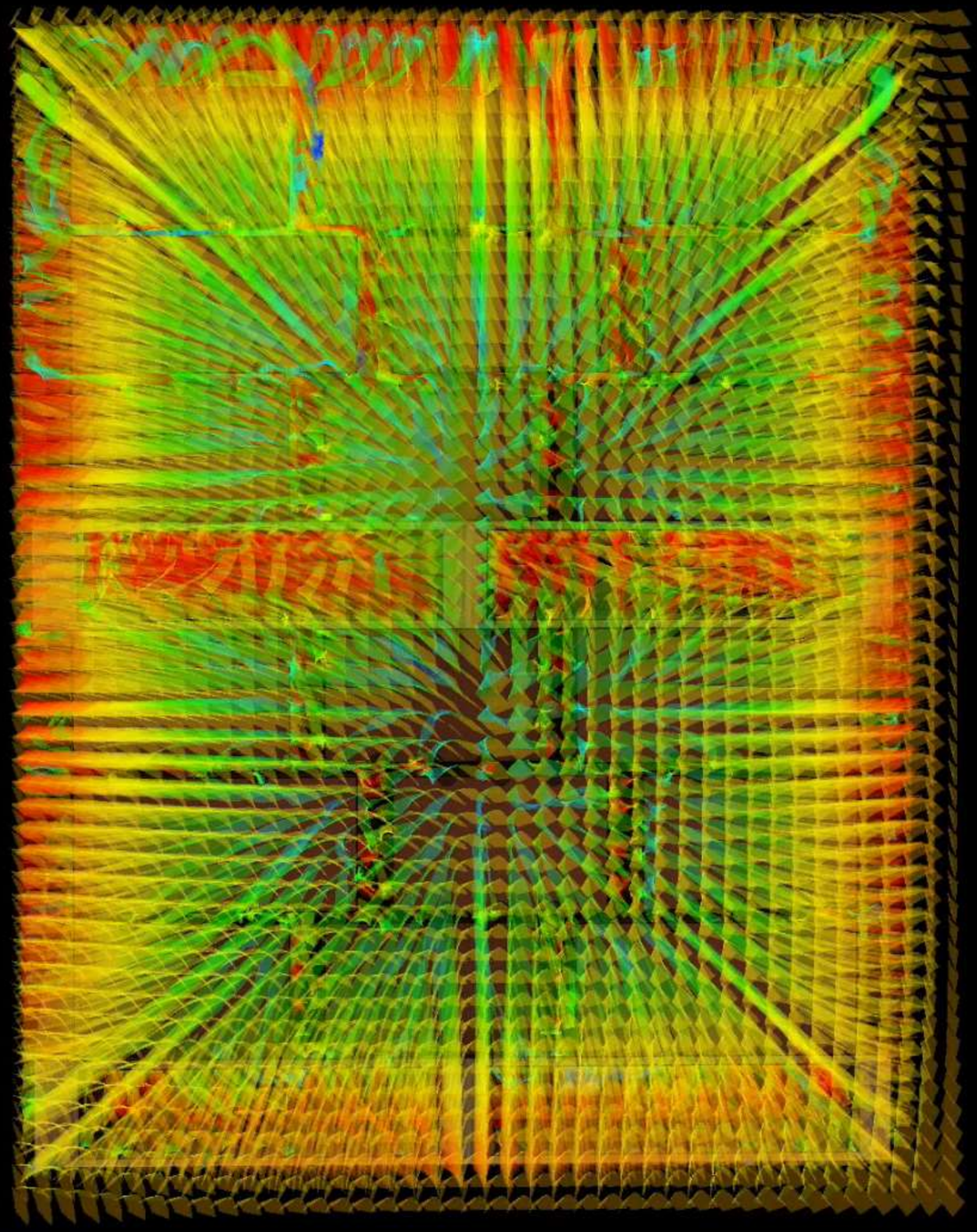
BLAST FREEZER



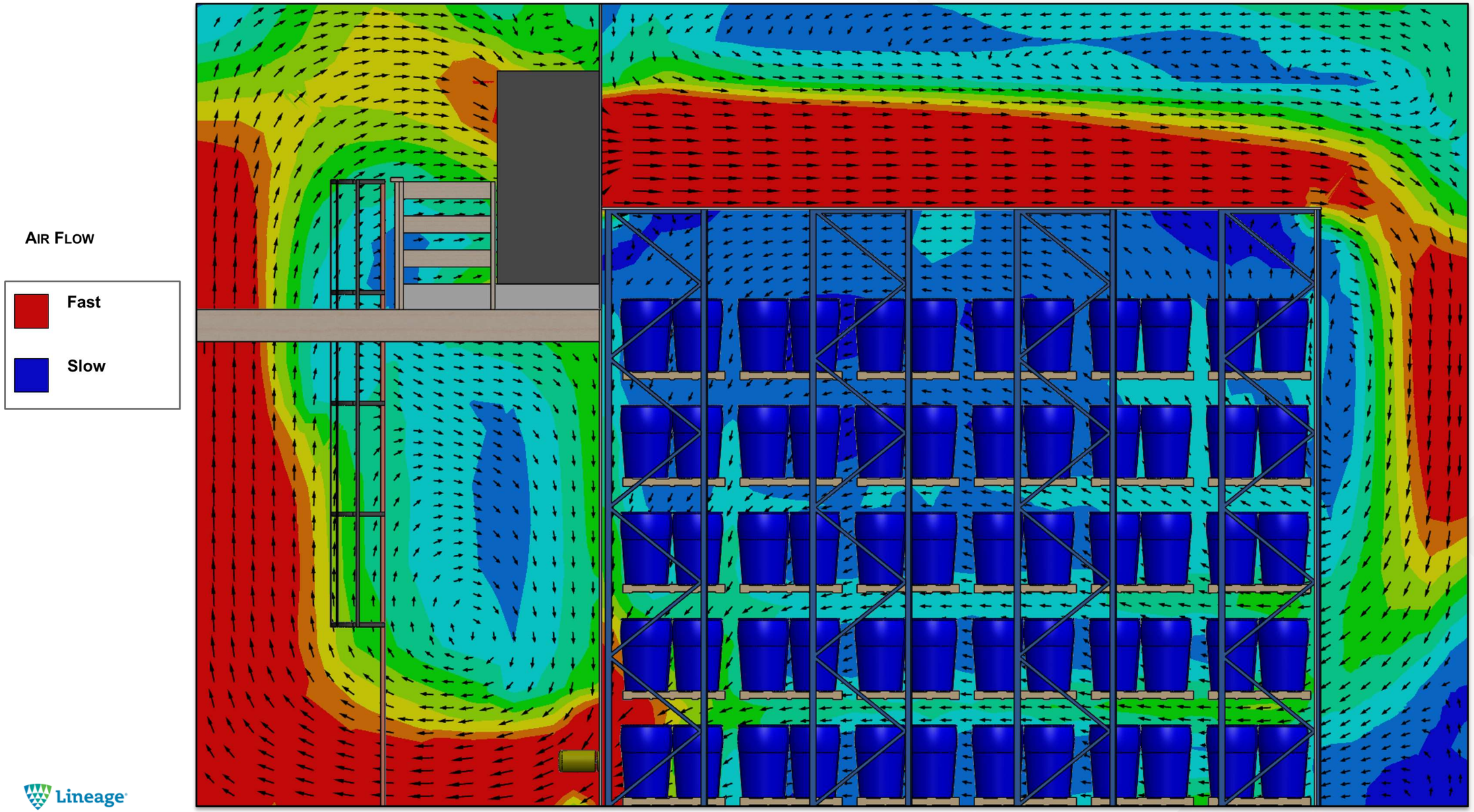
WHAT MAKES A GOOD BLAST CELL?

1. Blast Temperature and Refrigeration
   - Cells need appropriate refrigeration capacity to remove product heat load

2. Blast Airflow
   - Cells need appropriate structural design for consistent, evenly-distributed airflow to cool all product within a cell



PROBLEM ASSESSMENT



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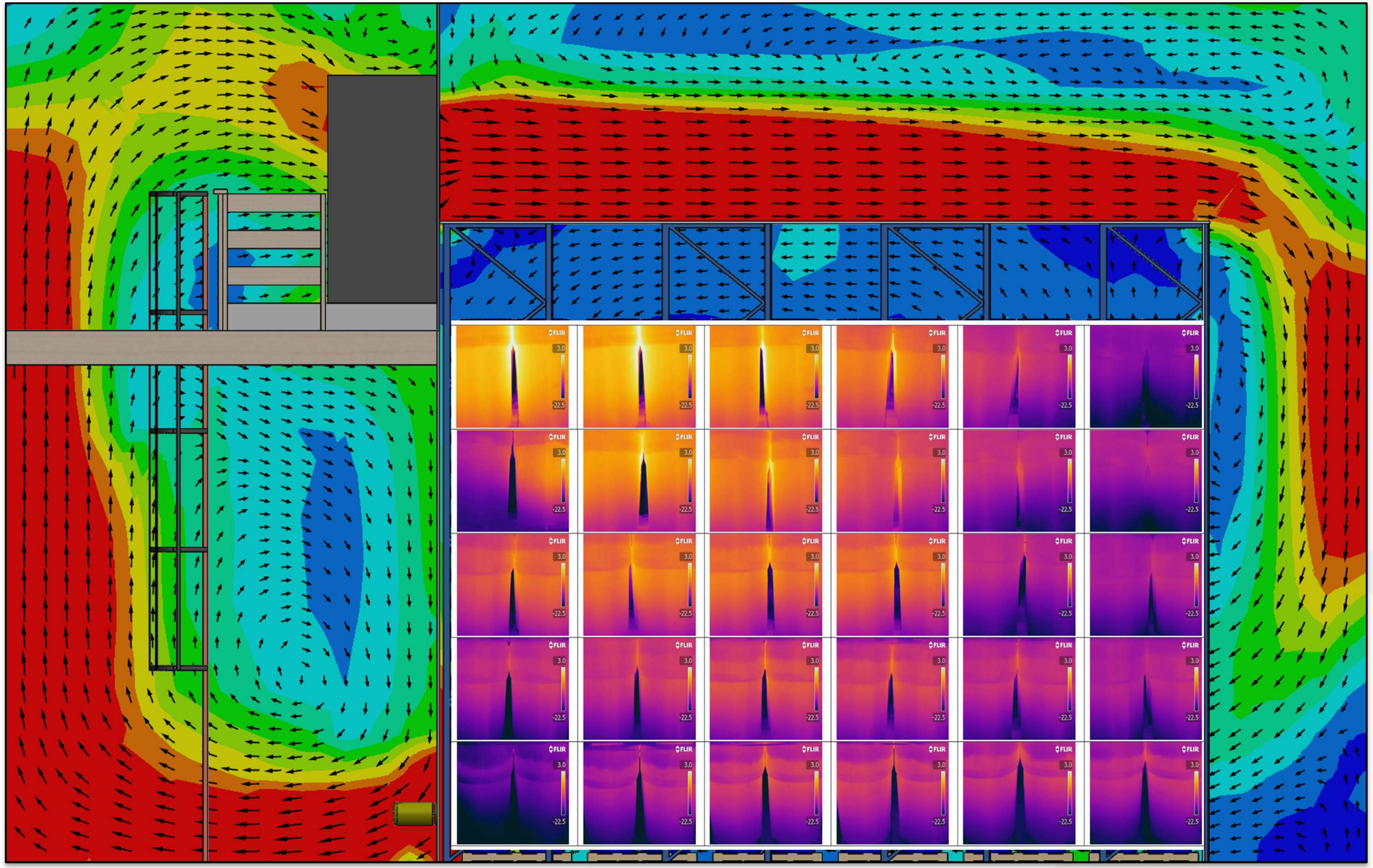
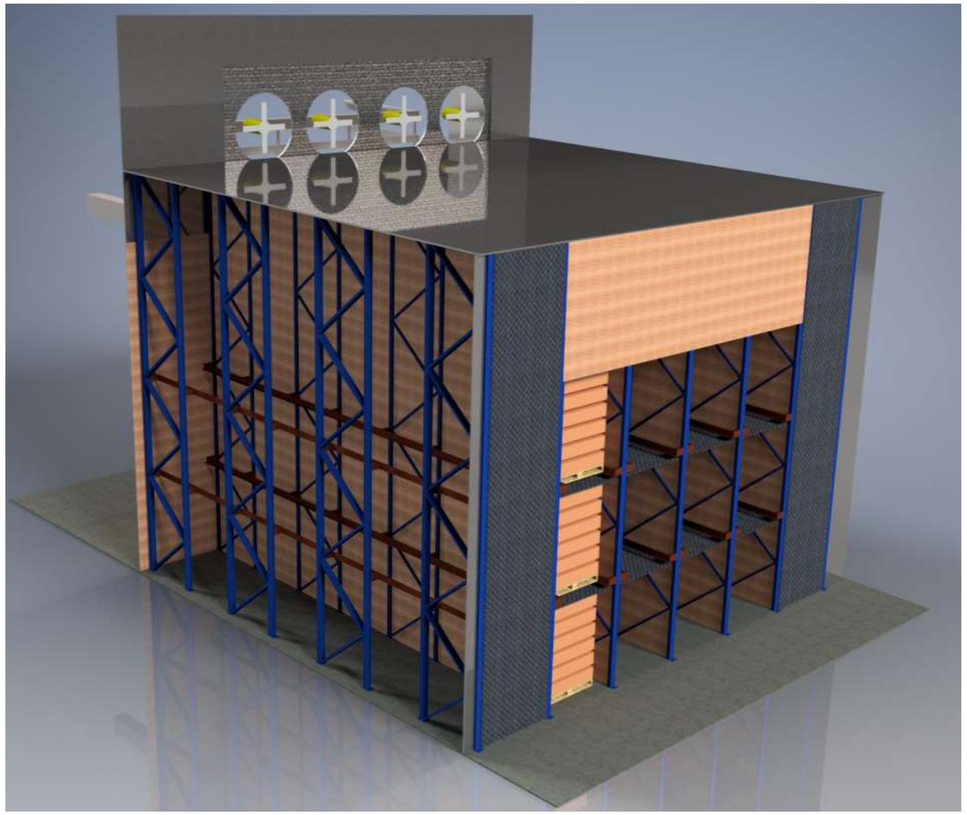
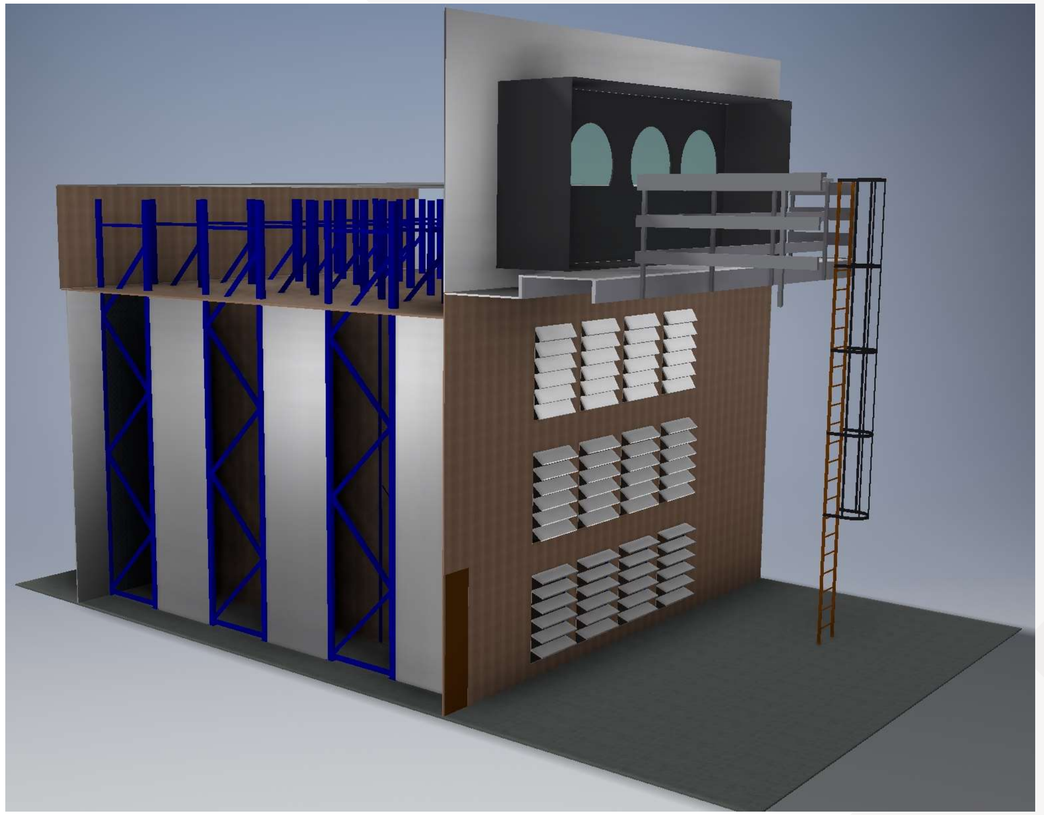
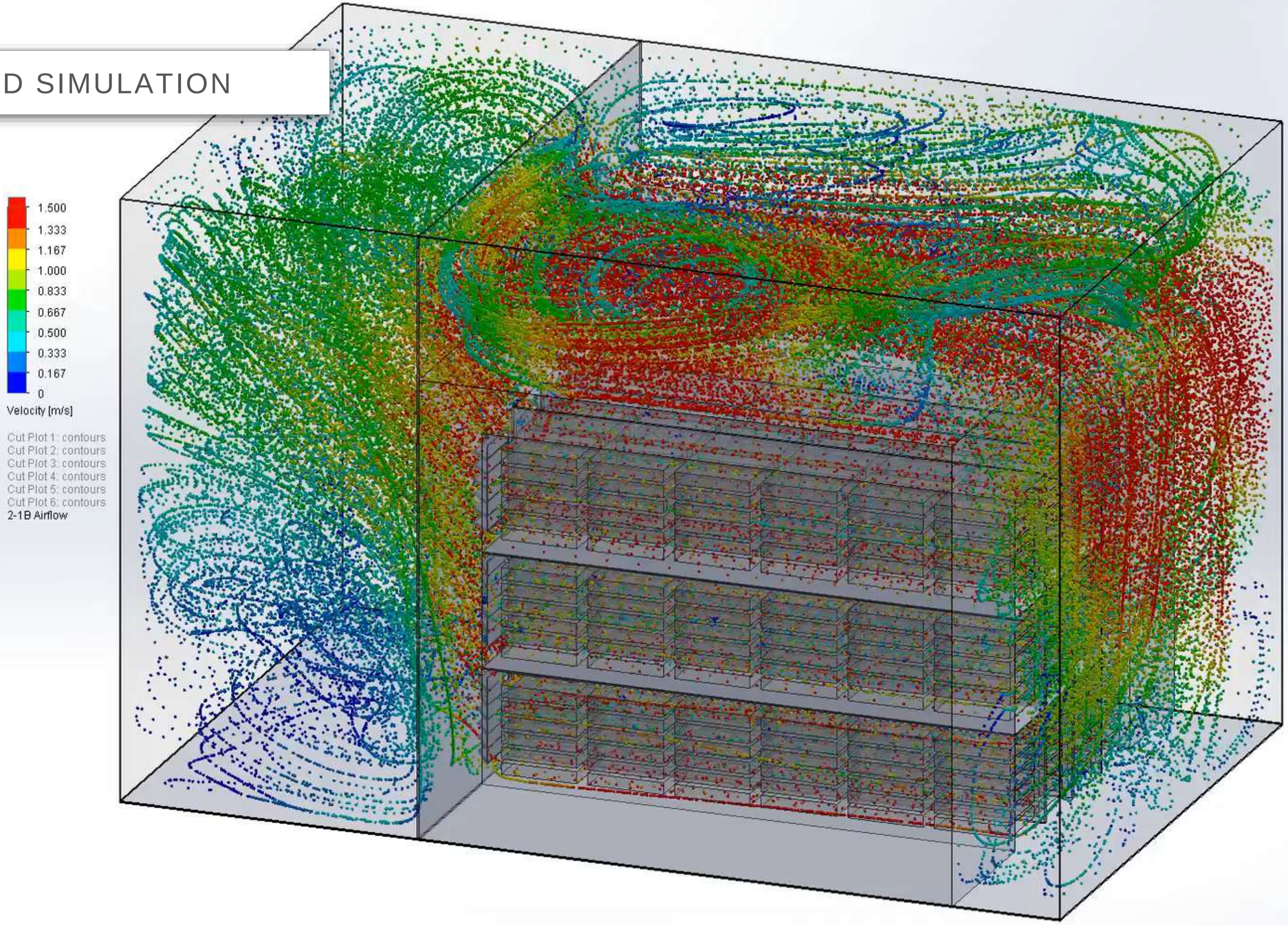


“TUNNEL CELL” R&D

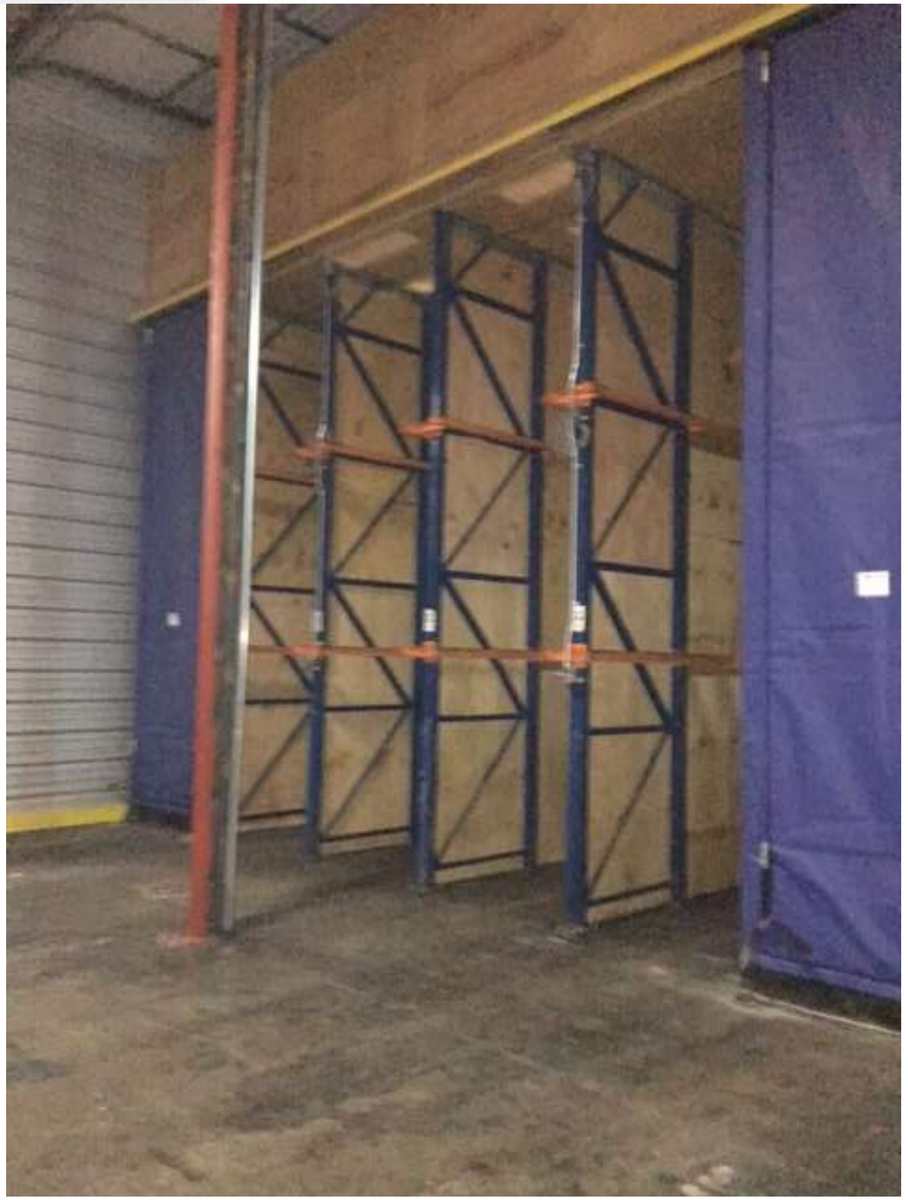




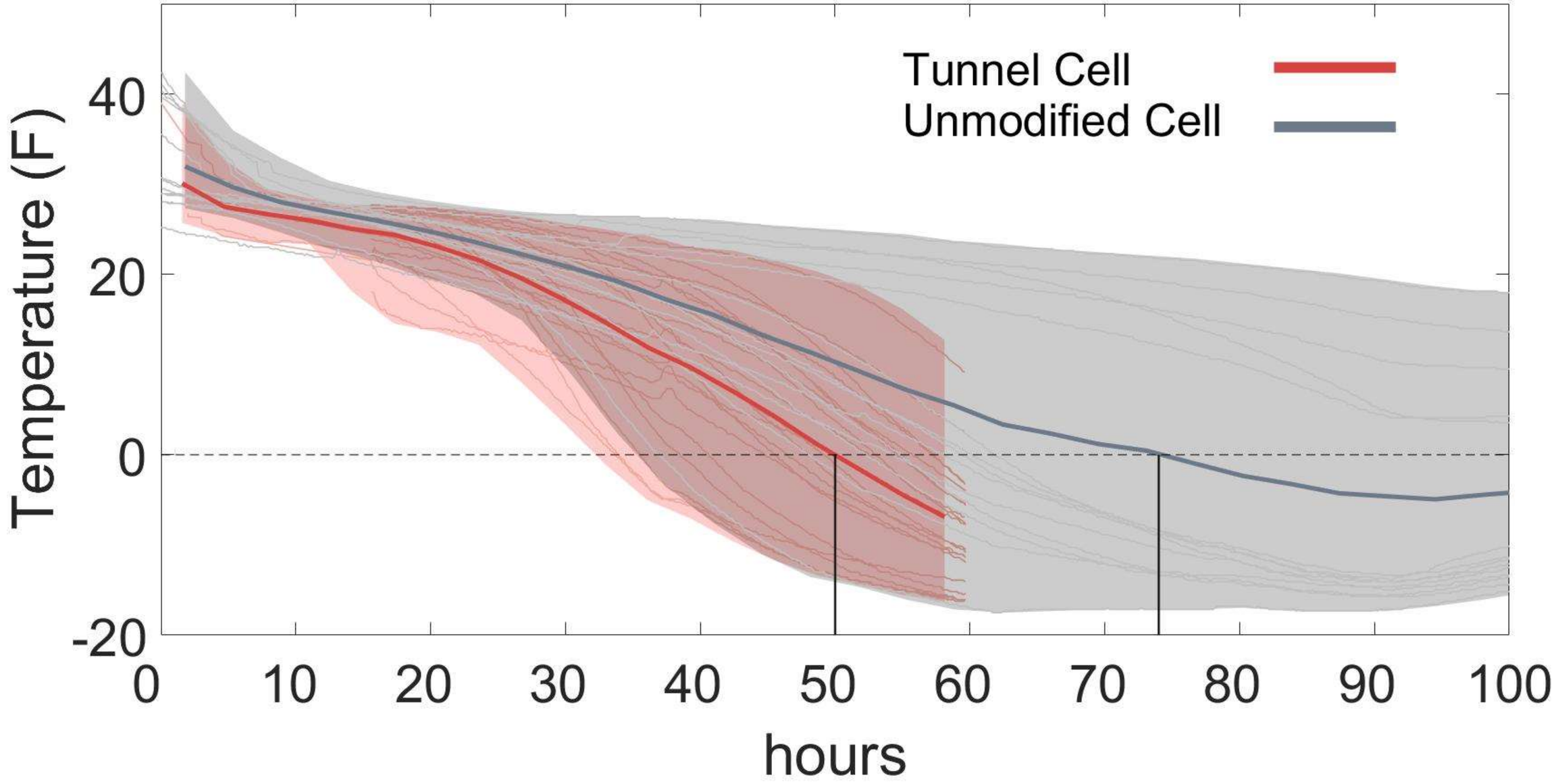
CFD SIMULATION



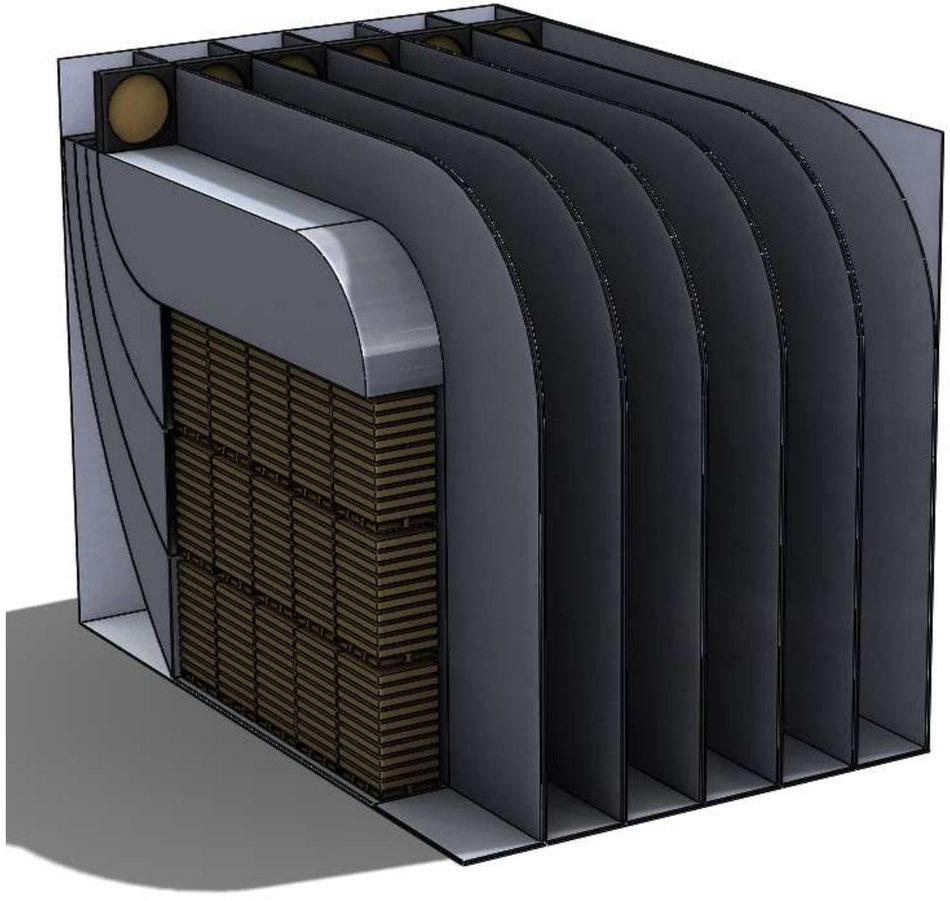
TEST BUILD

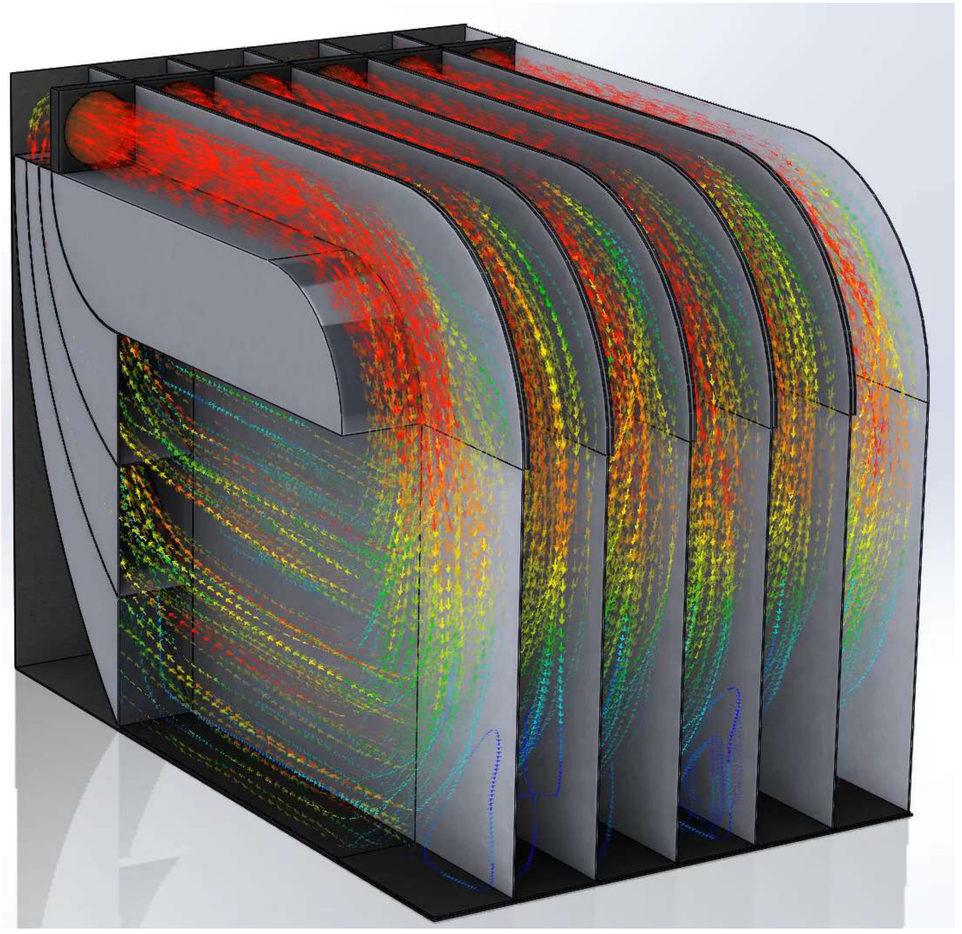


EXPERIMENTAL RESULTS

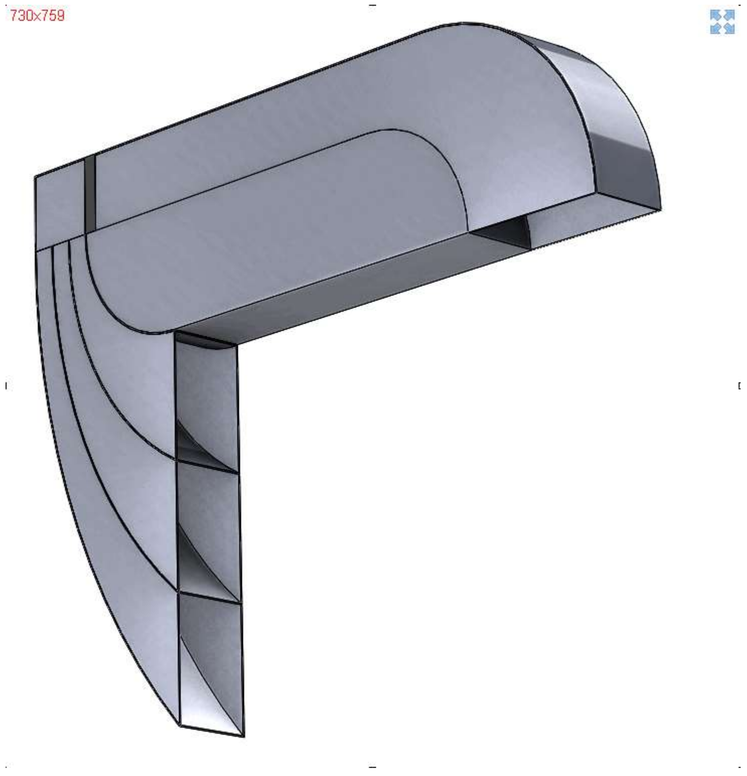


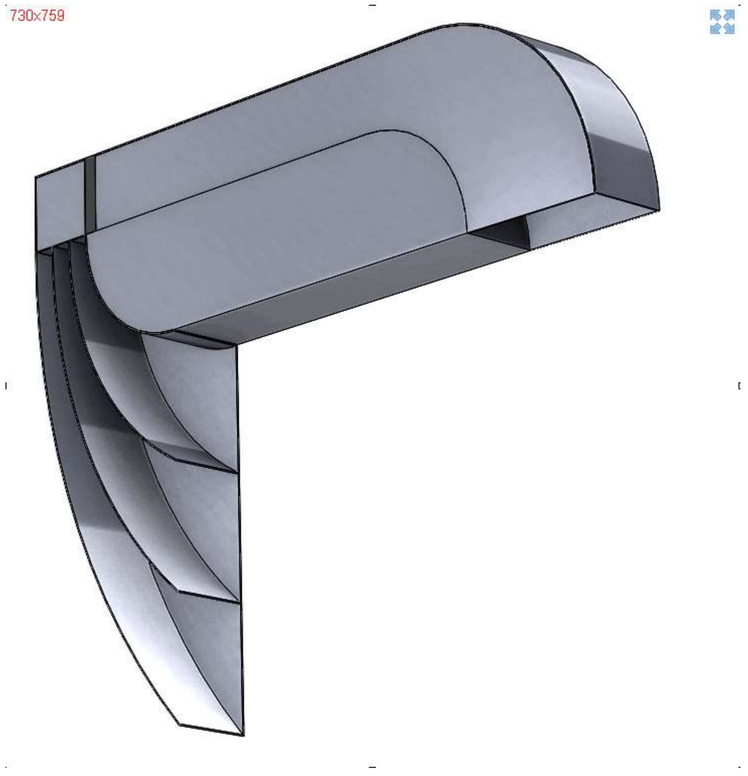
BLAST CELL CONCEPT W/GUIDED AIRFLOW

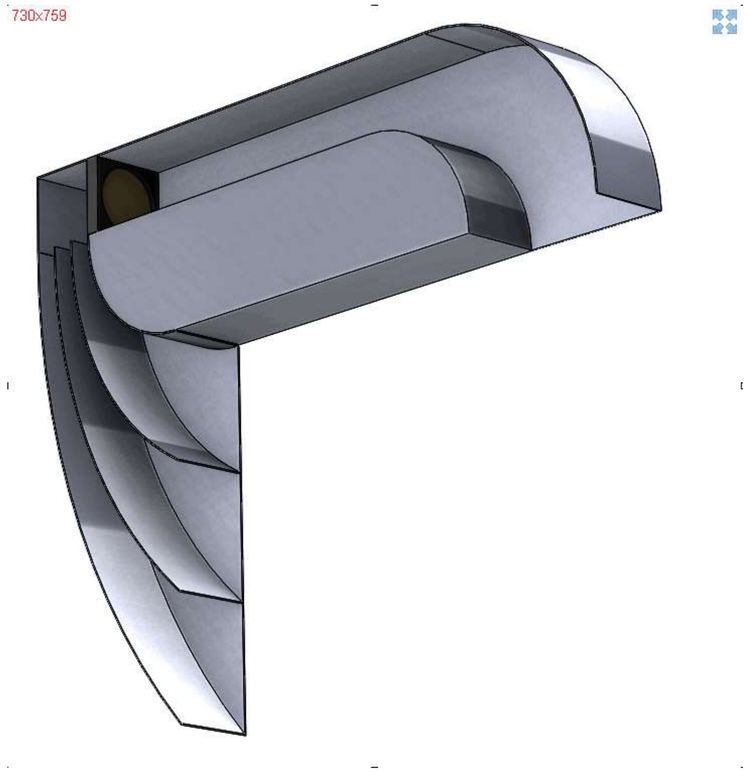




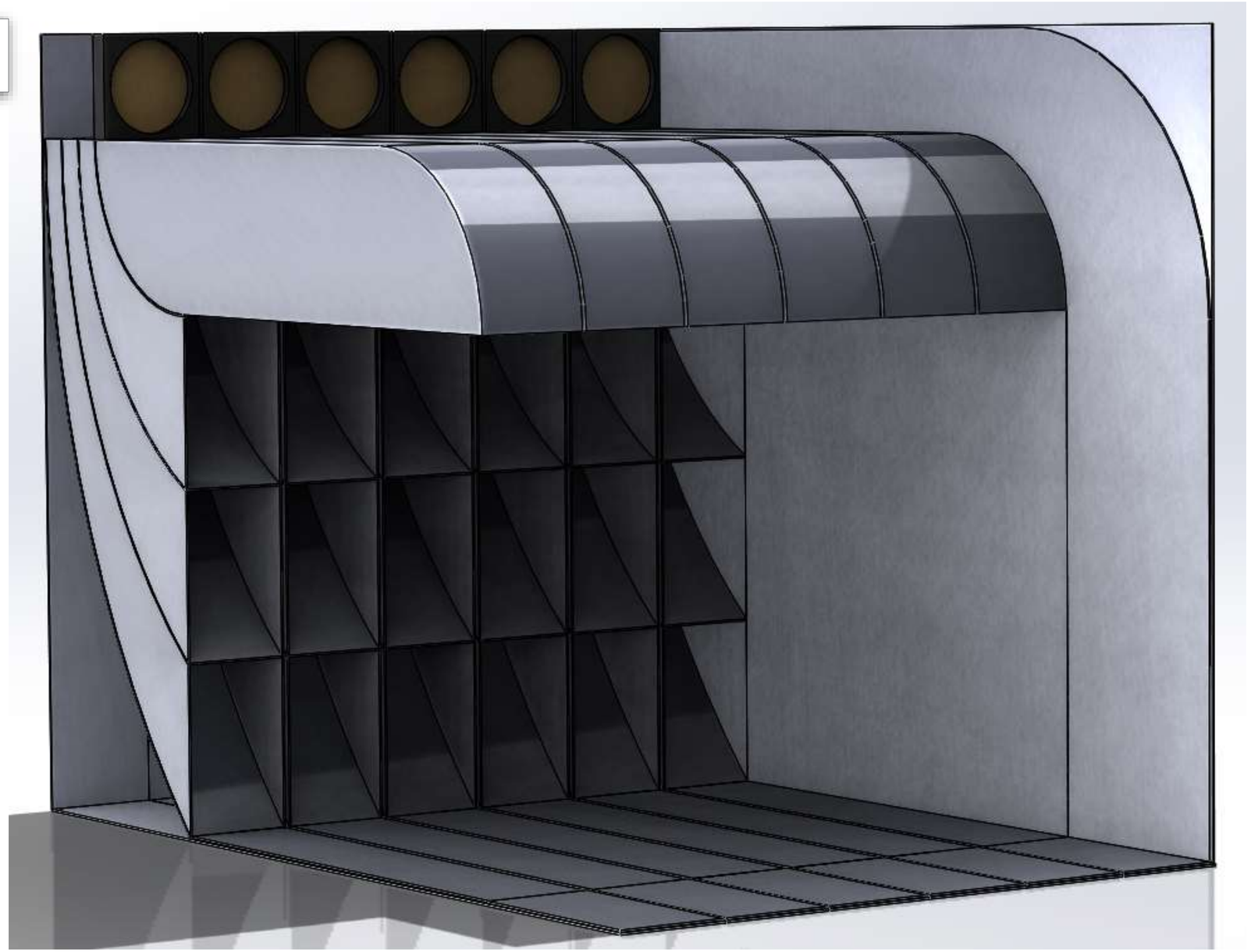
GUIDED AIRFLOW





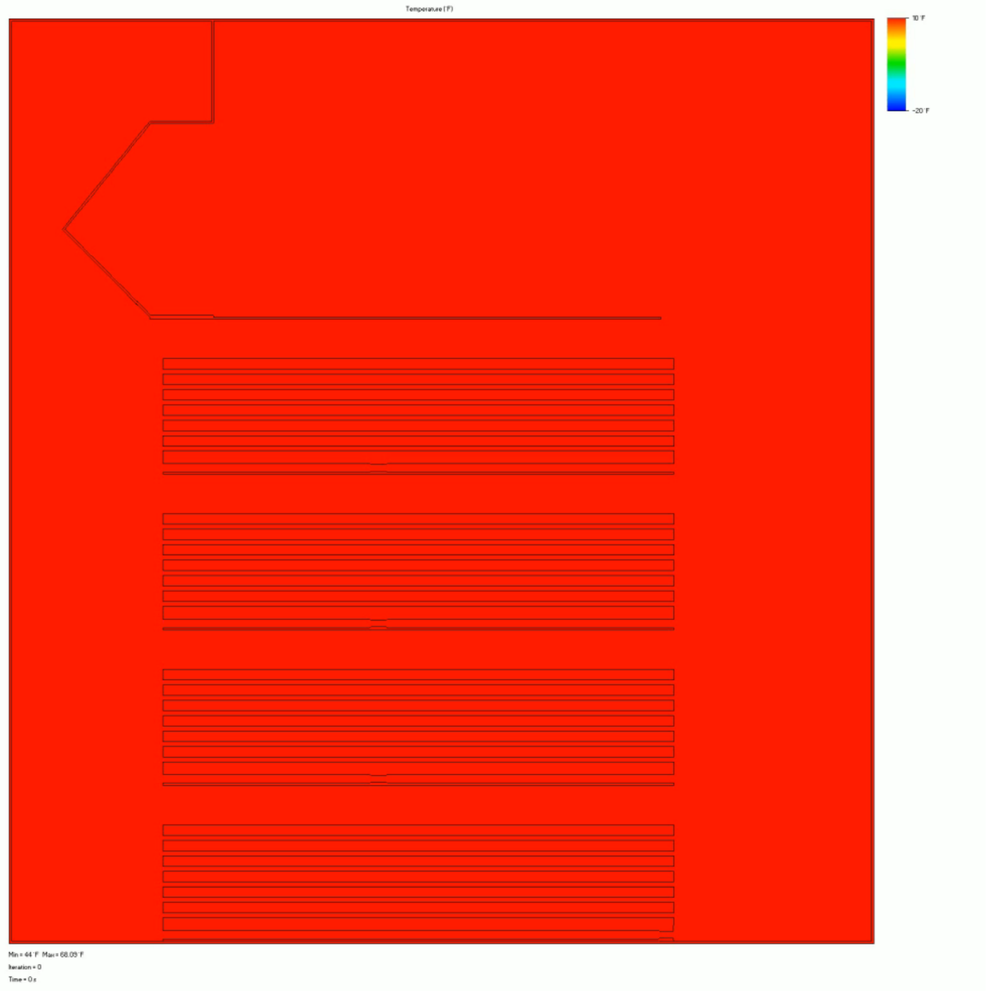


MODULAR

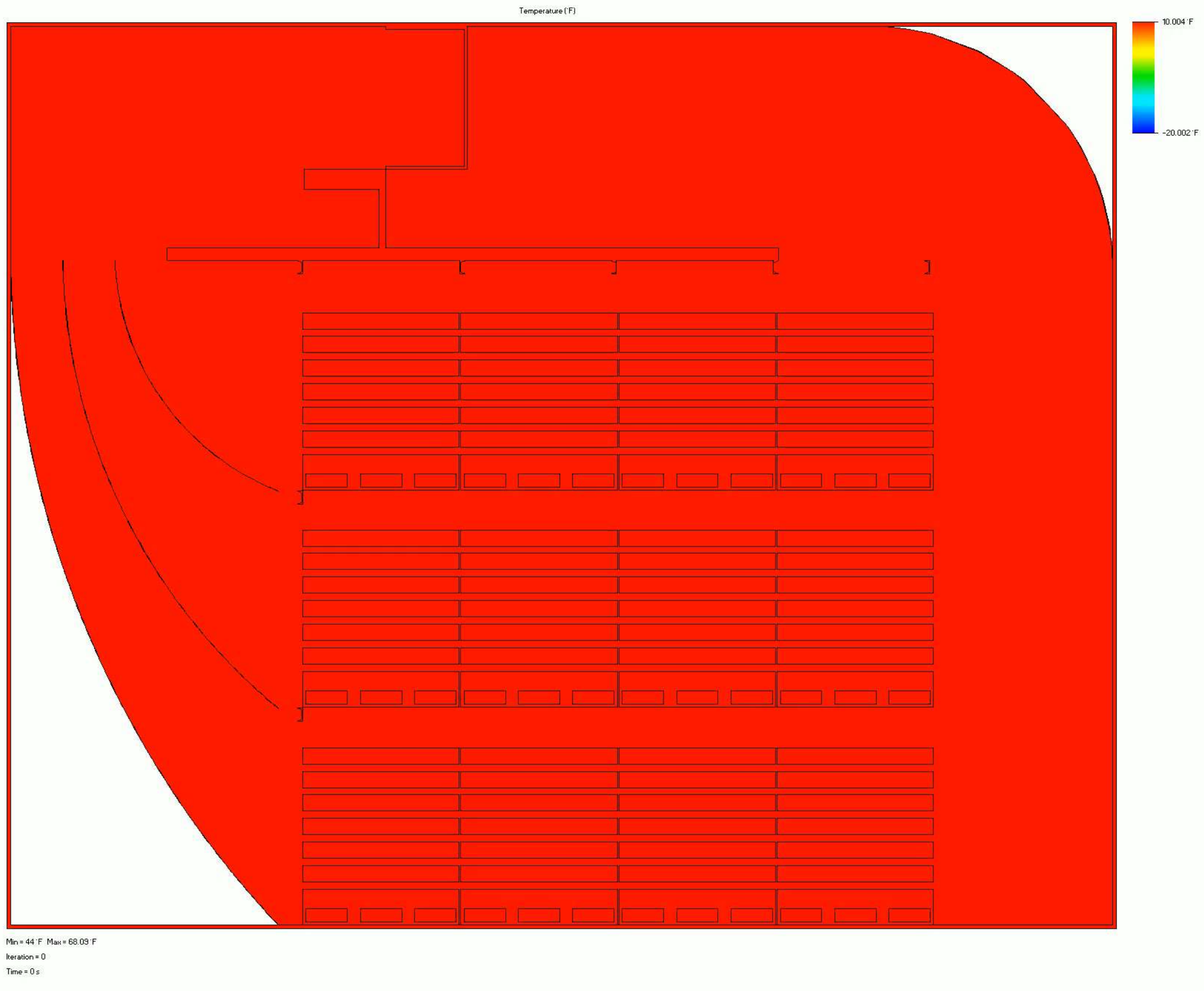


TEMPERATURE COMPARISON

Standard Backthrow Blast Cell

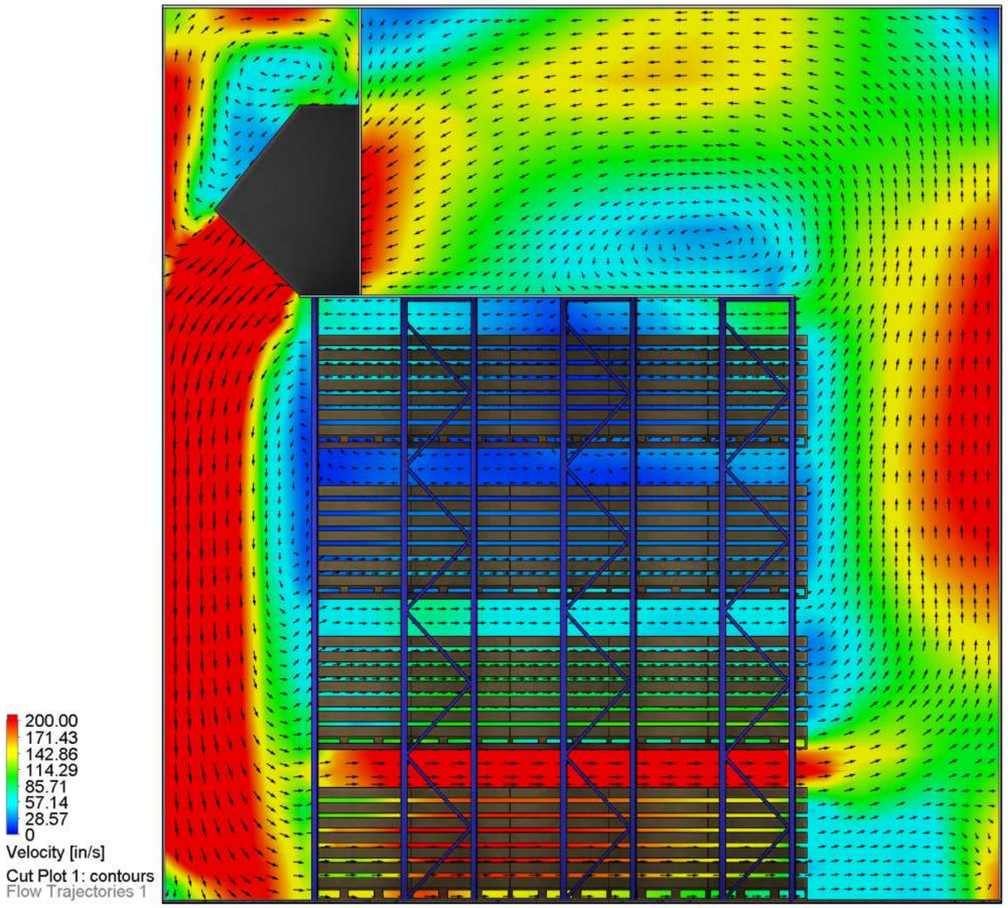


Guided Airflow Blast Cell

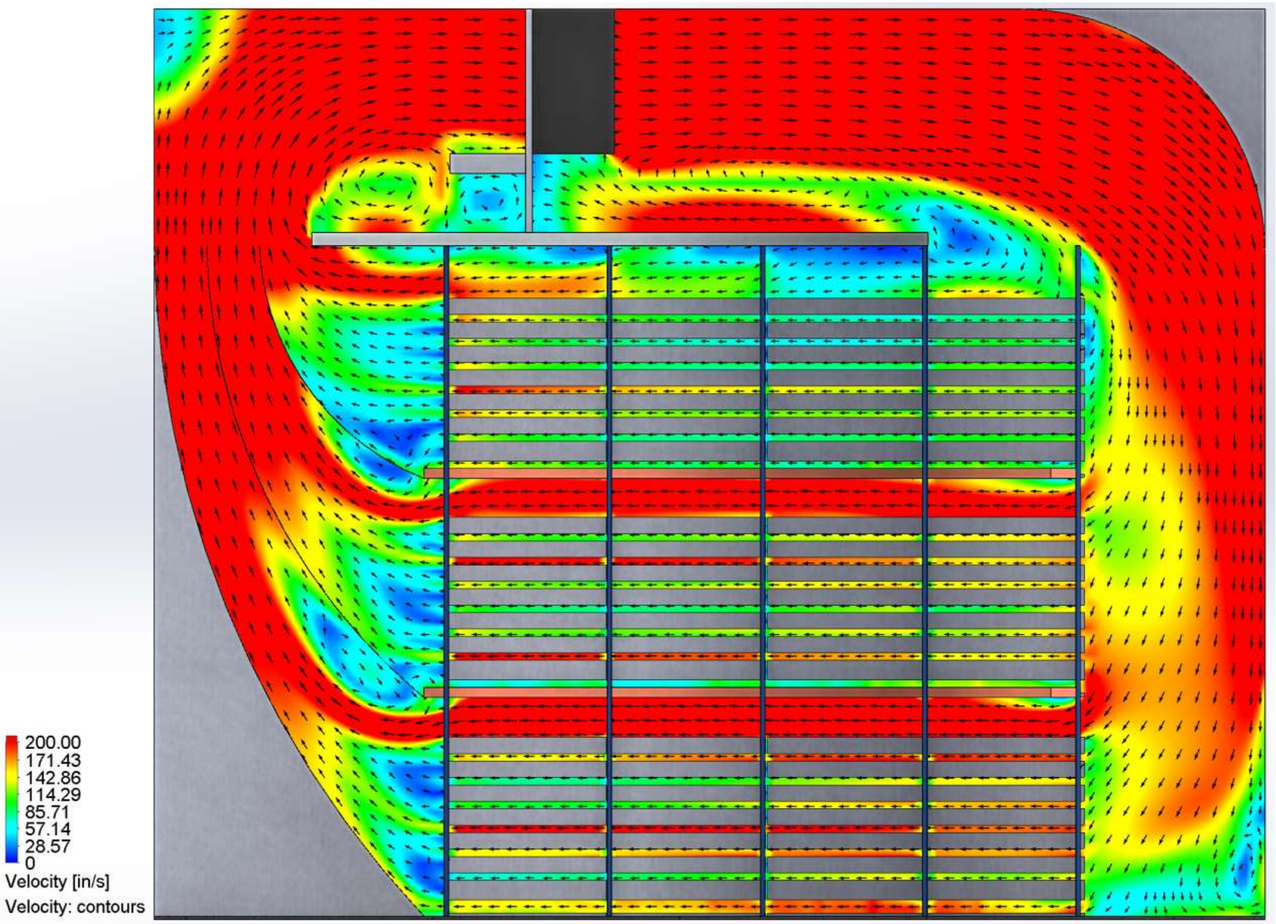


AIRFLOW COMPARISON

Standard Backthrow Blast Cell



Guided Airflow Blast Cell



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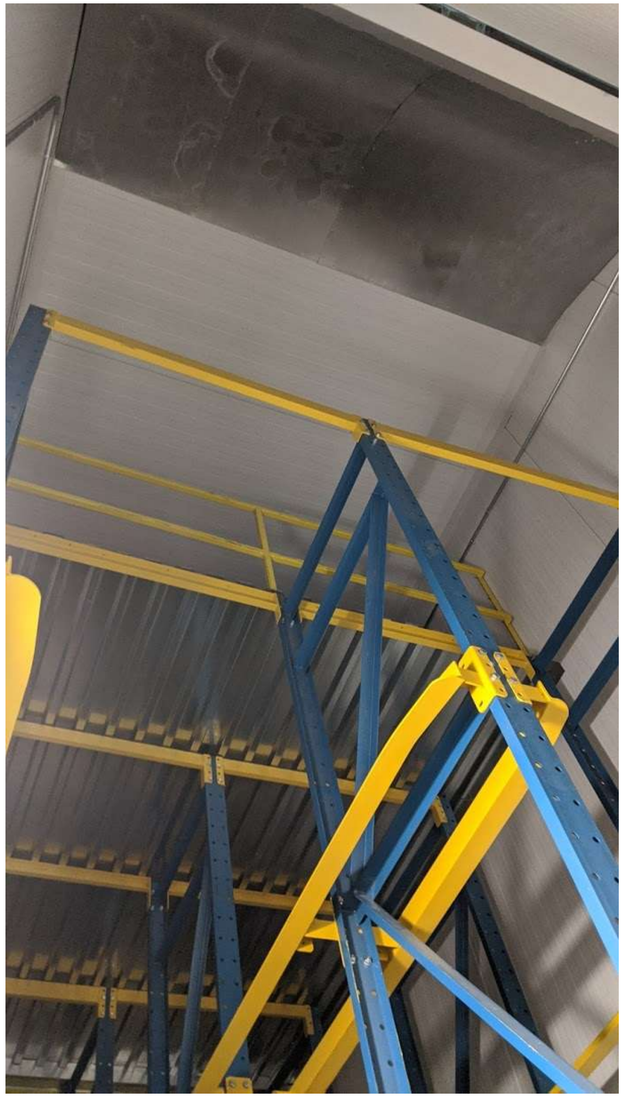

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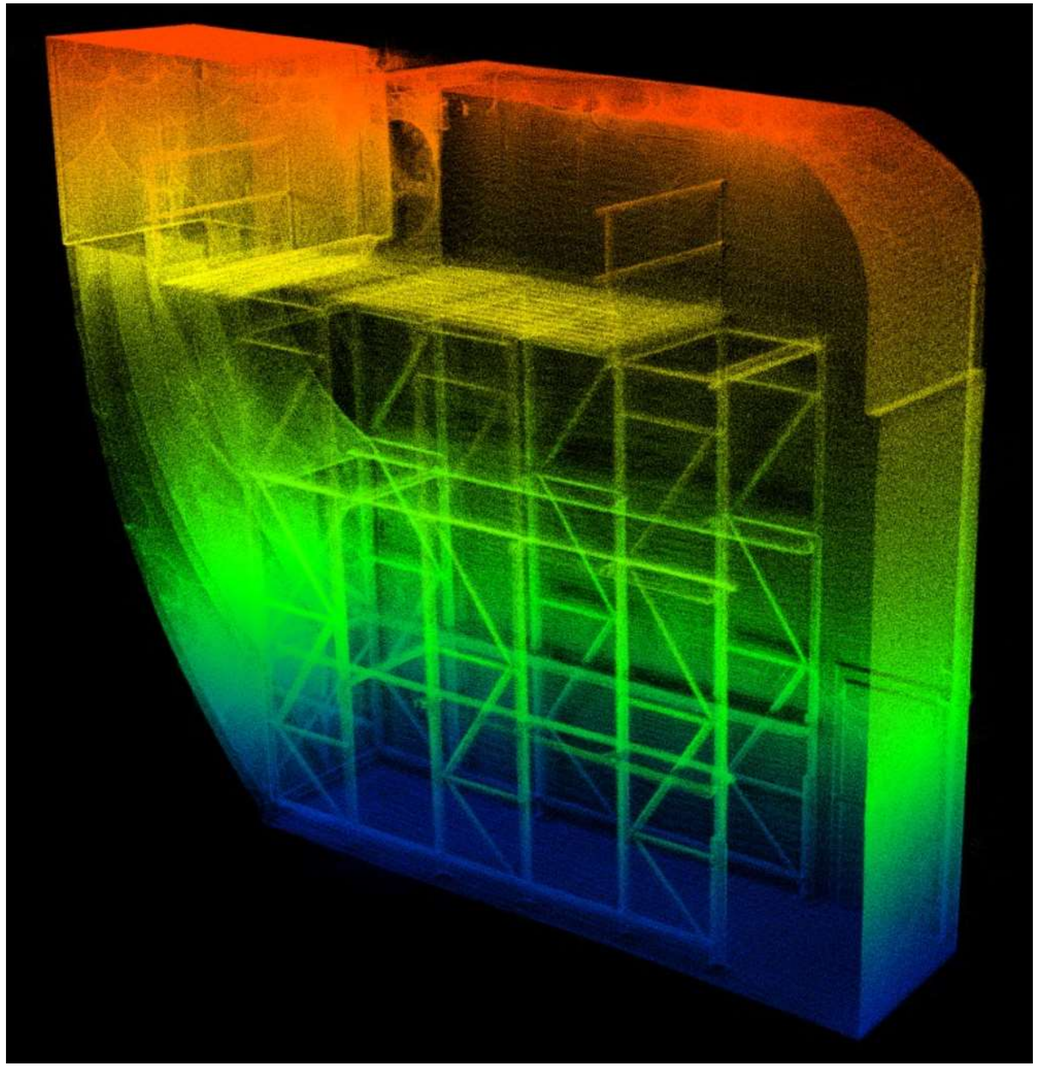
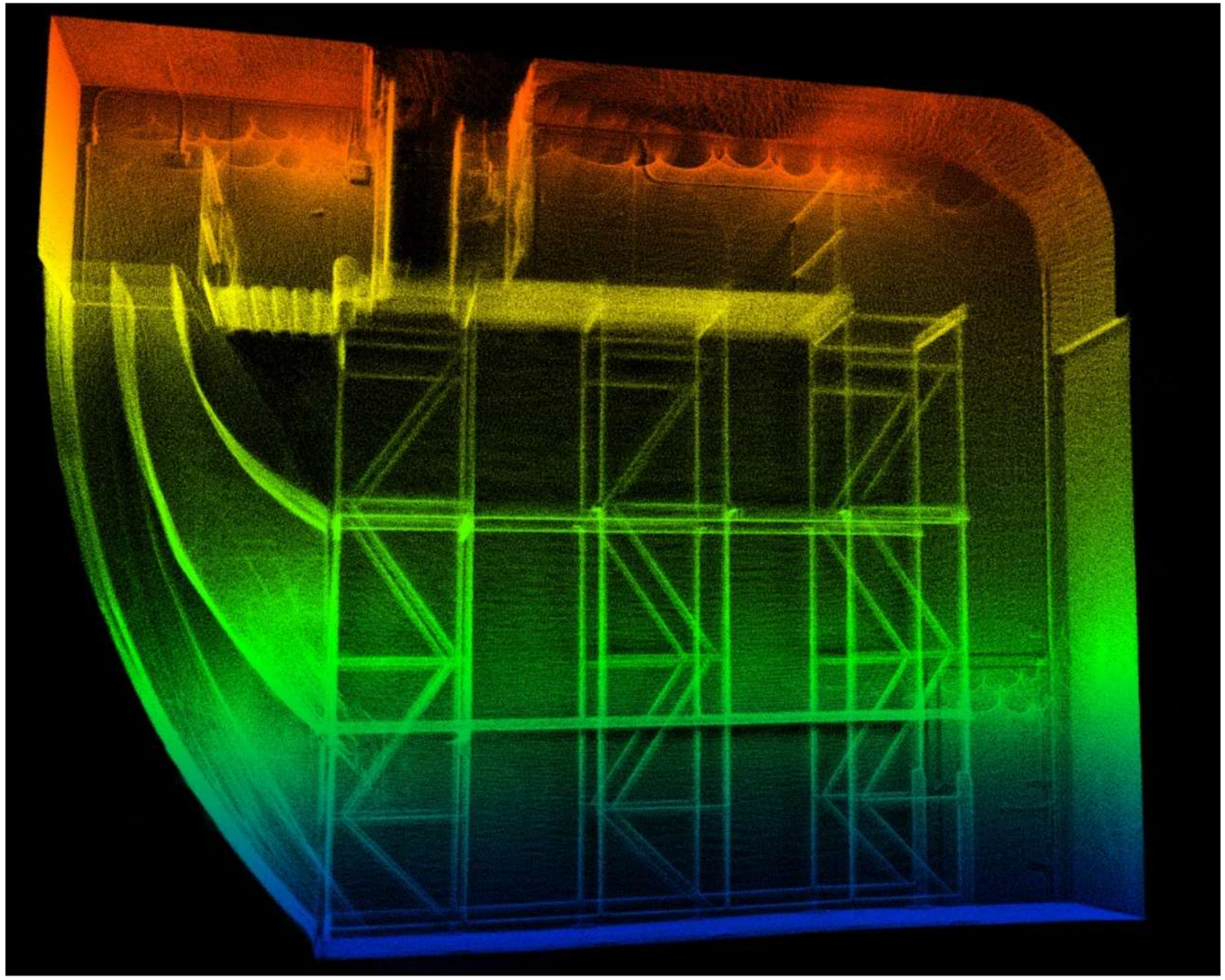
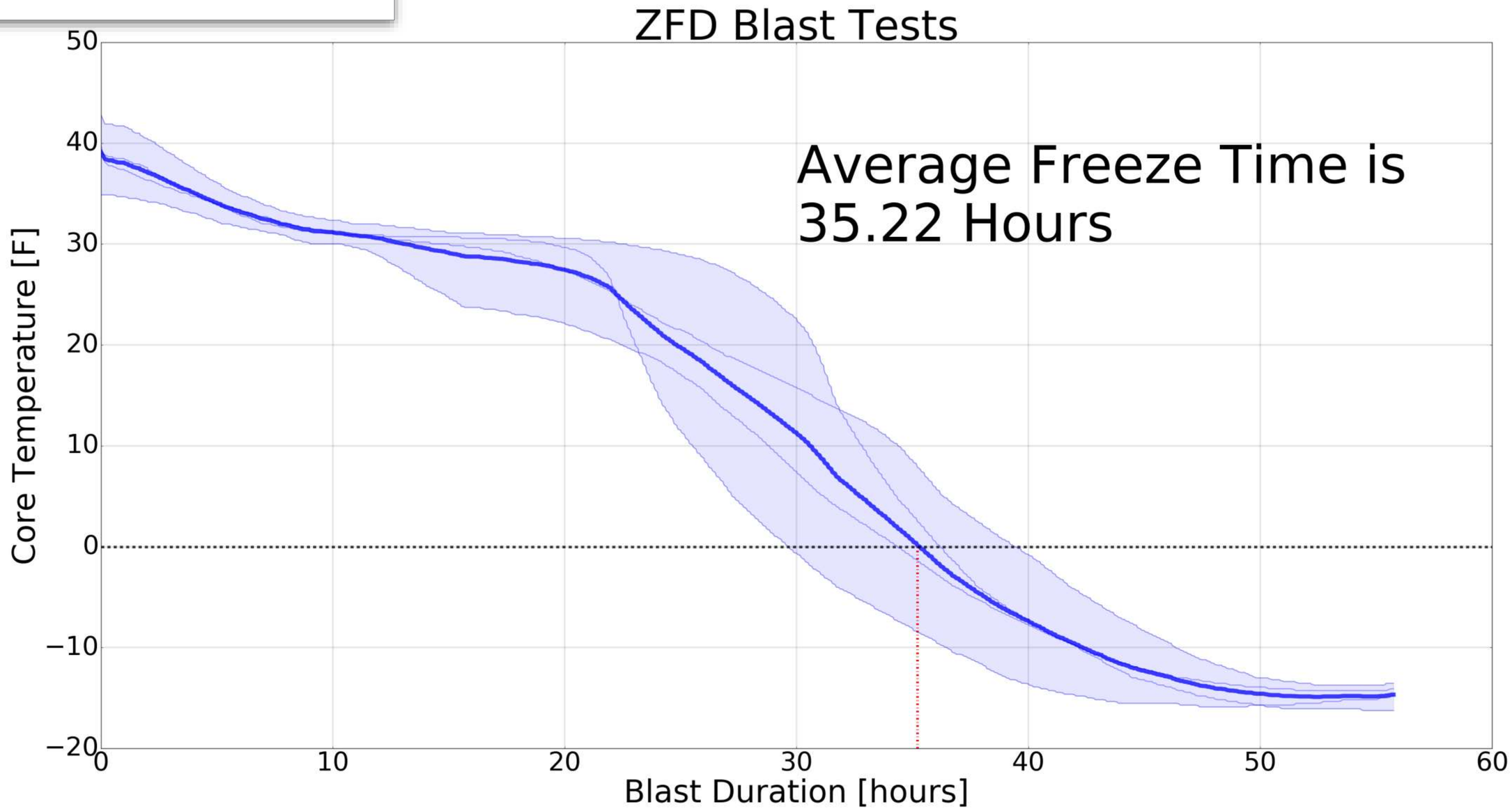




Lineage

EXPERIMENTAL RESULTS

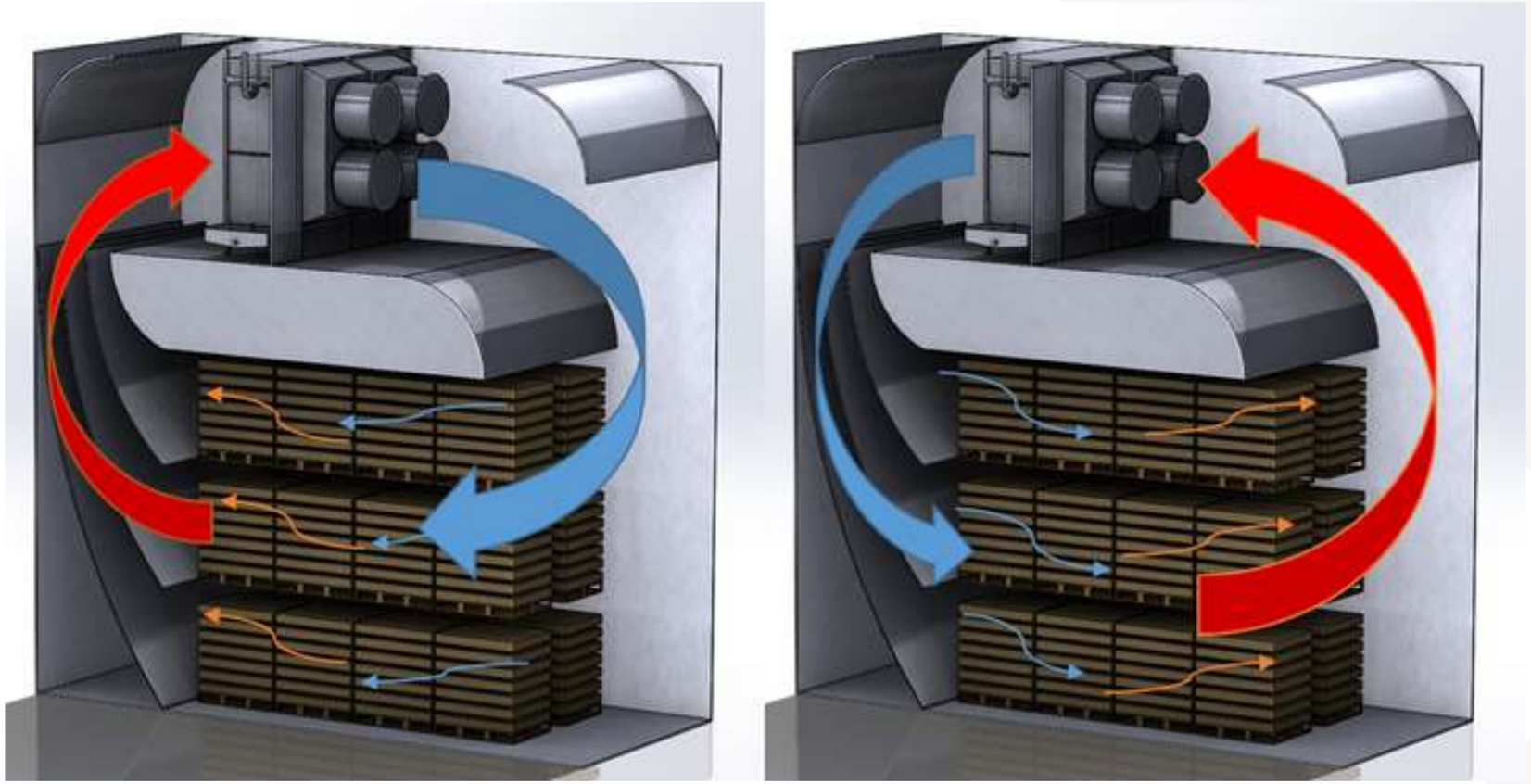


Lineage

Table 1 Time and Energy Savings of ZFD Design

Annual Projection	Standard Blast	ZFD
Blast Runtime, hours	7,514	3,653
# of Blast Cells	5	5
Product Blasted, lbs.	56,356,802	56,356,802
Total Power Consumption, kWh	3,844,273	3,215,860
Energy Efficiency, kWh/pallet	122.8	102.7

FUTURE IMPROVEMENTS



MODULAR TUNNEL BLAST CELL

Attorney Docket No. 41979-0013001

CONTROLLED BLAST CELL COOLING

TECHNICAL FIELD

[0001] This specification relates to technology for efficiently cooling physical items in a blast cell.

BACKGROUND

[0002] Convective air blast freezing is a process by which freezing of items like foodstuffs is facilitated by flowing very cold air over the items via mechanical force, typically in very large volumes of goods (e.g., many pallets) and airflow (e.g., thousands of cubic feet per minute (CFM)). Blast freezing is typically used on perishable foods (e.g., fruits and meats) geographically near their point of initial food processing. Such goods may then be stored for a short or long period in frozen warehouse, and then shipped to a point close to their use (e.g., to a grocery store or a warehouse operated by a particular grocer).

[0003] Such food decays largely because it includes water, which when not frozen, is a

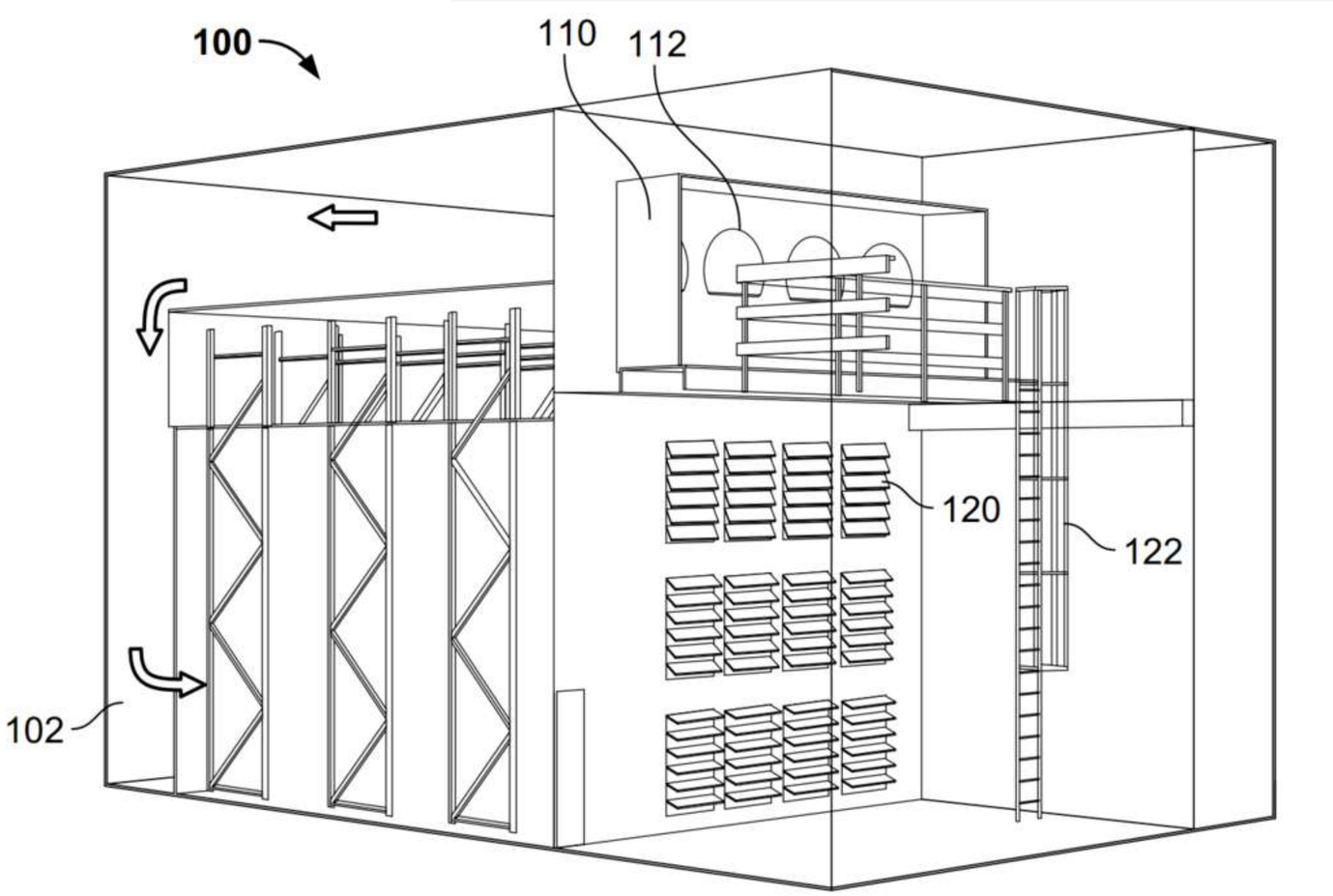


FIG. 1C

GUIDED AIRFLOW BLAST CELL

Attorney Docket No.: 41979-0049001

BLAST CELL COOLING WITH GUIDED AIRFLOW

TECHNICAL FIELD

[0001] This specification relates to technology for efficiently cooling physical items in a blast cell.

BACKGROUND

[0002] Convective air blast freezing is a process by which freezing of items like foodstuffs is facilitated by flowing very cold air over the items via mechanical force. Such air blast freezing can be typically used for very large volumes of goods that are carried on pallets. Airflow of thousands of cubic feet per minute (CFM) can be used for freezing. Blast freezing is typically used on perishable foods (e.g., fruits and meats) geographically near their point of initial food processing. Such goods may then be stored for a short or long period in frozen warehouse, and then shipped to a point close to their use, such as to a grocery store or a warehouse operated by a particular grocer.

[0003] Such food decays largely because it includes water, which when not frozen, is a hospitable environment for bacteria and other pathogens. Blast freezing can prevent this process and thus is employed broadly in the food distribution industry. Blast freezing can be a large and

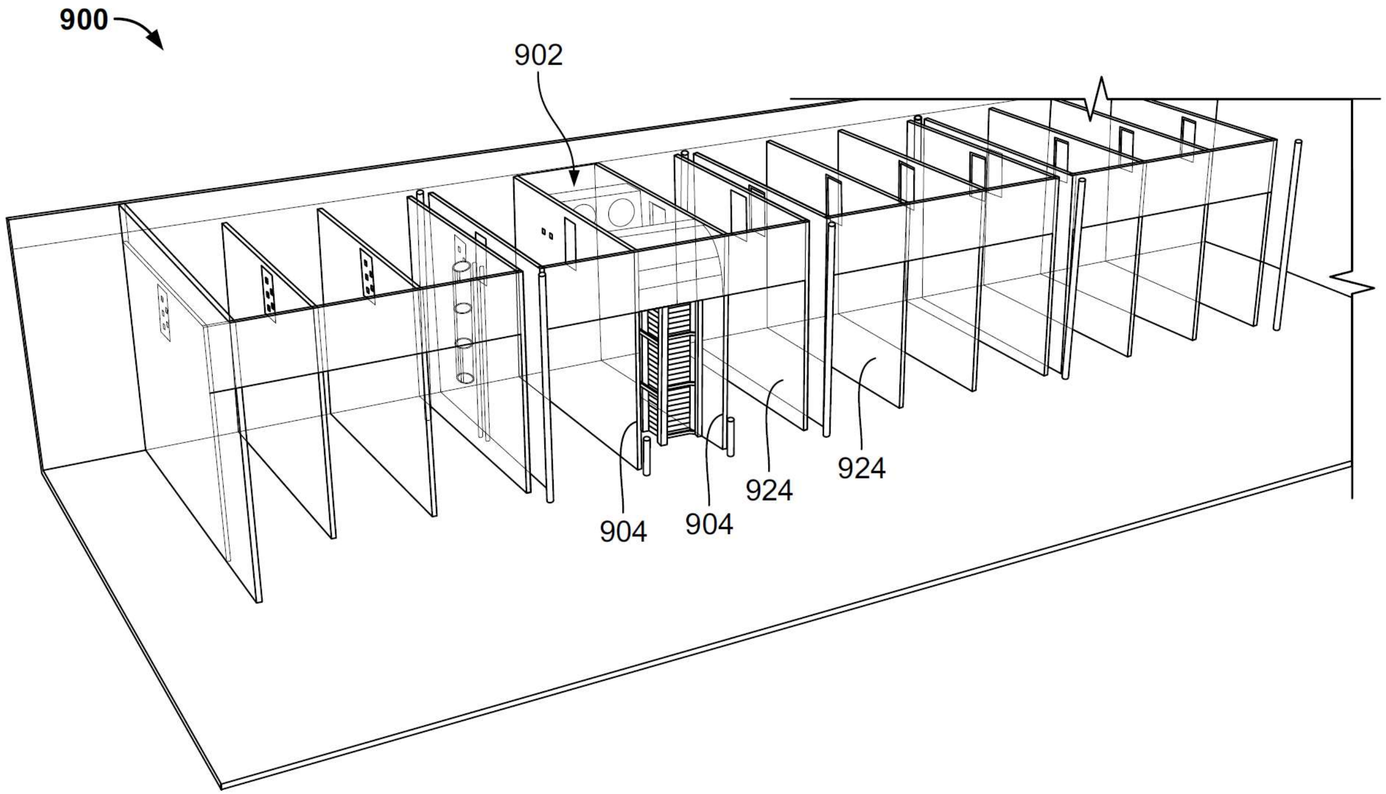


FIG. 9

Thank You!